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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/653,200	09/03/2003	Koichi Kawashima	60188-641	1760

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EXAMINER

AHMED, SHAMIM

ART UNIT PAPER NUMBER

1765

DATE MAILED: 05/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/653,200

Applicant(s)

KAWASHIMA, KOICHI

Examiner

Shamim Ahmed

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 September 2003.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-14 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 03 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 2,6 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Regarding claim 2, the phrase "etching is performed so that a pattern size obtained after the etching of the film to be etched is larger than a predetermined size" renders the claim indefinite because it is not clear how the pattern size would be larger, while etching is performed with the thick deposits on the resist pattern. It is noted that the pattern size should be smaller because the sidewall of the resist pattern is protected with the deposits and narrow the size pattern, which is formed on the film to be etched (see also figures 8B-8D).

4. Regarding claim 6, the phrase "etching is performed so that a pattern size obtained after the etching of the film to be etched is smaller than a predetermined size" renders the claim indefinite because it is not clear how the pattern size would be smaller, while etching is performed without the thick deposits on the resist pattern. It is noted that the pattern size should be larger because the sidewall of the resist pattern is not protected with the deposits and widen the size pattern, which is formed on the film to be etched (see also figures 6A-8D).

As to claim 11, similar explanation applies for the steps (a) and step (b), respectively.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al (6,569,778).

Lee et al disclose a patterning process including the steps of:

- Forming a film (24,25) to be etched over a semiconductor substrate;
- A resist pattern (26) is formed on the film to be etched, wherein the resist pattern is formed using an ArF exposure source; and
- Etching the film to be etched using the resist pattern as a mask using fluorine –based gas and argon gas, wherein a large amount of polymer (28) is being deposited on both side faces of the resist pattern (col.3, lines 44-60).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 1765

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 2-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (6,569,778) in view of Carmody et al (5,549,784).

Lee et al discusses above in the paragraph 6 .

Lee et al also teach that the etching process uses etching gases for allowing etching using a gas mixture of CF_4 and oxygen and polymer forming condition using gas mixture of Ar and CH_2F_2 or CHF_3 (col.5, lines 19-25 and lines 42-50 to col.6, lines 15).

As to claims 5 and 9, Lee et al further teach that at the end of the etching process, the etched feature is free from the polymer deposits (col.6, lines 16-30).

Therefore, the above-mentioned process of sequential etching and deposition and etching to remove the deposited polymer material reads on the claimed limitation of "etching the film to be etched so that no deposits are deposited".

Lee et al fail to teach the first etching gas is SF_6 instead of CF_4 .

However, in a method of etching dielectric material, Carmody et al teach that the fluorine gas comprises any one of CF_4 and SF_6 (col.4, lines 20-25).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to replace CF_4 of Lee et al with the SF_6 of Carmody et al because both the fluorine containing gas are functionally equivalent as taught by Carmody et al.

As to claims 2-3,6-7, and 11, the desired pattern size would have been obvious because all the etching constituents such as the gas mixture of SF₆, CHF₂ and oxygen are similar as the invented ones and expected to have similar effect.

9. Claims 5 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al (6,337,277) in view of Hada et al (6,087,063).

Chou et al disclose a process for etching a dielectric material using photoresist mask, wherein the photoresist is selectively exposed using a light to form the photoresist pattern (col.11, lines 14-36).

Chou et al also teach etching the dielectric material using the photoresist mask and etching, depositing unwanted polymer deposits and then etching the unwanted polymer deposits resulting the etched feature without the unwanted deposits (col.5, lines 16-30 and see figures 3A-3D).

Chou et al fail to disclose the photoresist layer is exposed with a light source of ArF excimer light.

However, Hada et al disclose a typical method of photolithographic patterning of a photoresist layer of acrylate family using a light source ArF laser beams of 193 nm wavelengths in order to form excellent pattern resolution (col.2, lines 46-65, col.10, lines 13-21 and col.14, lines 33-39).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of claimed invention to combine Hada et al's teaching into Chou et al's process in order to form line and space patterns with excellent resolution as taught by Hada et al.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Keller et al (6,069,087) teach that fluorine-based gas forms a passivating fluorine polymer on the surface of the photoresist layer for protecting the photoresist profile from the attack of fluorine ion (col.3, lines 28-58).

Keller et al also teach that an inert gas such as helium or argon can be used as a diluent gas (col.4, lines 17-22).

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Shamim Ahmed
Primary Examiner
Art Unit 1765

SA
Tuesday, April 26, 2005